

HUMAN IMPACTS ON GOLDEN EAGLES: A POSITIVE OUTLOOK FOR THE 1980s AND 1990s

by

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Until recent decades the Golden Eagle (*Aquila chrysaetos*) was literally shot on sight by predator control agents of the federal government, animal damage control personnel from state and local governments, caretakers of private hunting clubs, and even the public at large. The persecution complex of certain segments of American society even extended to our national emblem, the Bald Eagle (*Haliaeetus leucocephalus*.)

Eagle electrocutions, shootings, poisonings, and other such killings were considered beneficial by many—long after the Bald Eagle Protection Act was passed in 1940. Ironically, bounties were paid in Alaska for years after the enactment of protective legislation. And for some time after the Bald Eagle Protection Act was amended in 1962 to afford Golden Eagles similar protection, it was equally apparent that persecution of that species might continue indefinitely. Evidence abounds in the literature for considerable shooting and poisoning of Golden Eagles through the early 1970s.

But these direct mortality factors are not the only problems eagles have suffered in this century. There has also been during the same period of extensive persecution a great disarrangement of Bald and Golden Eagle habitats. The list of indirect detrimental factors runs from agricultural to urban development and includes the effects of harassment by pilots of small aircraft, sonic booms and low overflights by military planes, construction of dams and reservoirs, land conversions and other range management practices, casual human disturbance, timber management, mining and oil and gas development, power line construction and operation, recreation of many types, contamination by heavy metals and pesticides, and the building and use of roads and railroads. The cumulative effects of these numerous impacts seem staggering, yet, in spite of them, the Golden Eagle remains a common bird in the intermountain western United States and parts of Mexico and Canada.

The decade of the 1970s was truly a transitional period in American conservation. Public attitudes toward eagles and other raptors changed, as did the understanding of possible long-term effects of man's extensive use of key components of natural ecosystems. Positive changes began in the Fifties and Sixties, culminated in the Seventies, and many of them are still with us in the Eighties. These changes include the following:

1. Over 120 Indian tribes have essentially stopped killing eagles specifically for use in ceremonial headdresses, each of which took feathers from up to five eagles. They now obtain eagle feathers from carcasses collected by the U.S. Fish and Wildlife Service.

2. Shooting and trapping of eagles by Federal and state predator control agents has stopped. No permits to dispose of eagles suspected of preying on sheep have been given to ranchers for nearly a decade. Of particular note are the large fines and other penalties for shooting eagles from aircraft and the possible loss of Federal grazing rights by ranchers who violate eagle protection laws and regulations.

3. Use of rodent and coyote control poisons has been significantly curtailed on feder-

ally owned lands, and violations are actively investigated by U.S. Fish and Wildlife Service law enforcement agents. The abusive use of thallium sulfate in Wyoming in 1971 that killed numerous Bald and Golden Eagles indeed sparked a new era.

4. The public at large has been placed under closer scrutiny in cases of eagle shootings owing to the reward program of the National Wildlife Federation and the provision awarding half of all fines under the Bald Eagle Protection Act to an informant who provides evidence leading to a conviction.

5. The problem of eagles being electrocuted by power lines has been significantly reduced during the past decade through cooperative efforts of governmental agencies, conservation organizations, and the electric industry. This cooperation is now being extended into positive eagle habitat management programs by power companies.

6. Of great significance to the Bald Eagle, and to a lesser extent the Golden Eagle, use of DDT was banned in the early 1970s, and bans or severe restrictions have been placed on use of other persistent organochlorine pesticides. Considerable evidence of recovery in Osprey, Bald Eagle, Brown Pelican, and some Peregrine Falcon populations now exists.

7. To an unprecedented degree, changes in land use in eagle habitats are now routinely analyzed for their impacts on eagle populations, especially on Federal lands. Habitat management plans, nest territory plans, environmental assessments, and both short-term and long-term land-use plans of governmental agencies—and even plans for land consumptive private industrial projects—consider the well being of Bald and Golden Eagles.

8. Several refuges and sanctuaries were established during the 1970s which emphasize eagle protection. Examples include Idaho's Snake River Birds of Prey Natural Area (and proposed National Conservation Area), the Skagit River Bald Eagle Natural Area in Washington State, the Seymour Eagle Management Area in Alaska, and the Eagle Rock Audubon Sanctuary in Colorado.

9. Finally, the decade of the Seventies saw tremendous strides in research on various eagle management techniques including captive breeding, introduction of eagles to the wild, artificial feeding, nest relocation, and provision of artificial nesting structures. While these techniques may be more important to Bald Eagles in the early 1980s, existing management techniques have been proven appropriate for the Golden Eagle whenever the need arises.

While all of these relatively recent improvements in the relationships between man and eagles do not allow total optimism for the future, it is important to recognize that at the same time as American Indians were using eagle feathers heavily, persecution by control agents and ranchers was the worst, poisoning was at its peak, shooting by the general public was high, electrocution of eagles by power lines was far more commonplace, use of persistent pesticides was rampant, land use was proceeding without regard to eagle habitat protection, very few refuges or sanctuaries existed, and there was no confidence in our knowledge of eagle management techniques—when all of these things prevailed, there were still relatively high numbers of Golden Eagles throughout the West. One can speculate that Golden Eagle populations were slowly declining during that time, but it is impossible to produce conclusive evidence.

It is just as easy to speculate today that Golden Eagle numbers are slowly rising. What is even more clear, however, is that regional Golden Eagle populations are still regulated far more by natural fluctuations in jackrabbit numbers than they are by man's

activities. Research conducted by the Snake River Birds of Prey Study Group in Idaho and by others clearly shows that many adult Golden Eagles do not breed when the prey base is low. Data also indicate that the number of young produced is directly related to prey availability. Thus, the relatively slow reproductive rate and long maturation period of Golden Eagles does not allow them to follow year-to-year fluctuations in prey numbers as closely as smaller, earlier maturing raptors with higher reproductive potentials. However, the longevity of mature Golden Eagles carries the species through years when they cannot breed, leaving the major burden of mortality on younger age classes.

Thus, whether Golden Eagle populations are slowly declining or slowly increasing in 1982 may not be relevant to long-term survival of the species. We must not become preoccupied with counting eagles—either live ones or dead ones. Rather, our valuable attention must be focused wherever traditional Golden Eagle nesting areas have been or soon will be taken over by man's pursuit of land ownership, land-based recreation, and land consumptive businesses. We must focus on improving what we have spoiled and on minimizing the effects of what we have planned. What will be required is more change. The behavioral and distributional traditions of certain pairs of Golden Eagles, which use land man wishes to "disarrange," must be modified. And there must be a corresponding change in the perception of and attitude toward nature by much of the human population, particularly the decisionmakers in our society.

In fact, the latter change is occurring. Witness the nine points discussed above. What is too often overlooked, however, is that the behavior of raptors is changing: "birds of prey are exploiting the potential of living in concert with men. Given half a chance, they will even breed in spite of us...Birds of prey can live close to man: near busy highways, in areas used heavily for recreational purposes, and within stone's throw of buildings, windmills, and other man-made structures. Some even nest on objects like utility poles, windmills, abandoned buildings, and steel towers." (Olendorff, R. R. 1975. *Golden Eagle Country*. Alfred A. Knopf, New York. p. xv.)

To the staunch idealist this may not be good news; wild things must exist in pristine settings or not at all. To the perceptive realist, however, the ability of individuals of a species to adapt to an inevitably changing world is an exploitable trait. This trait may well ensure the survival of the species, not only in areas which remain wild and natural, but also in nearby disturbed areas which can possibly be managed to produce as many or more Golden Eagles as undisturbed areas.

One of the most promising exploitable traits of certain raptors which allows a positive outlook is this capacity for nesting on man-made nest substrates. For every traditional nest site of Golden Eagles taken over by human activities and other land-uses, there is a void created which might be filled with birds through management. In many cases only the nest site is rendered useless. Foraging areas, which characteristically are more flexible and not so site specific, are commonly left intact, but poorly used, being too distant from an adequate nest site. Such local gaps in raptor populations also occur naturally, particularly in the vast monotypical sagebrush and grassland habitats of mid-western and western North America.

In light of this, it is not surprising that raptors commonly build nests on power line transmission towers erected in these voids. Nor is it surprising that industry is supporting

considerable research to exploit this trait—first as a raptor habitat management technique and second as possible mitigation for the adverse impacts of development on raptors.

One such research project is being conducted by Pacific Power and Light Company (PPL) along a 525-mile transmission line running between Midpoint (near Twin Falls), Idaho, and Malin, Oregon (Fig. 1). Thirty-seven steel nesting platforms were included as part of the initial design and construction of this line. The platforms were patterned after the original wooden and fiberglass versions used in the pilot programs conducted by the Idaho Power Company, Utah Power and Light Company, and Bonneville Power Administration in several western and northwestern states.

The PPL structures are made of 1/4-inch galvanized steel and are expected to last the life of the line. They were mounted below the conductors to help prevent possible flashovers caused by bird excrement and also to provide easier access by researchers. Collection of data from these platforms is just beginning and will require long-term monitoring, but, even at this early date, observations have yielded information which may be useful in similar programs now under consideration.

Exactly 20 Golden Eagle eyries are known to have been abandoned during the past 30 years outside of the Snake River Canyon but within 20 miles of the Idaho stretch of the new PPL line. There certainly have been more abandonments where historical occupancy was never documented and where very old records could not be verified by nest remains or other evidence during site visits made in 1982. But in only one of 20 verifiable cases is at least one of the adult birds known to have been killed; most of the remainder have apparently been forced away by human activity.

Regardless of the precise number of abandoned Golden Eagle eyries, human activities have created an unusual need for nesting sites for nearly 20 pairs of adult eagles which may still have decades to live. One scenario is that some of these displaced birds have taken up residence between the Snake River Canyon and the mountains to the north. In this area an adequate prey base exists, but nesting sites are either not available, marginally useable, or already in use.

In 1980 and 1981 PPL placed 12 of the 37 steel artificial platforms in Idaho. In 1981 and 1982, four of these Idaho platforms were occupied by raptors: 2 by Golden Eagles, 1 by Ferruginous Hawks (*Buteo regalis*), and 1 by Red-tailed Hawks (*Buteo jamaicensis*). This level of occupancy after only one or two years is noteworthy, but the speed with which some pairs of eagles adopted the structures is even more remarkable. This was particularly noticeable in a case along the new PPL line at Little Canyon Creek where the platform seemingly provided a better nest site than the traditional (marginally useable?) cliff nest site.

The PPL line runs 400 yards south of the well established nest site on a south-facing cliff in the bottom of the canyon. Three stick nests are maintained by the adults. One has a little shade into which young birds can escape from the searing summer heat. The other two nests have no shade, and in an average year the young often succumb to heat prostration, a well documented mortality factor of young Golden Eagles. The heat problem at Little Canyon Creek is accentuated by the cliff being at the bottom of a canyon with little air movement and by the black basalt rock which absorbs the sun's heat.

The PPL line was finished during the fall of 1981 after one young was raised in the shaded Little Canyon Creek cliff site. The adults had an opportunity to perch on and inspect the platform during early winter courtship. Apparently, a rapid change from the

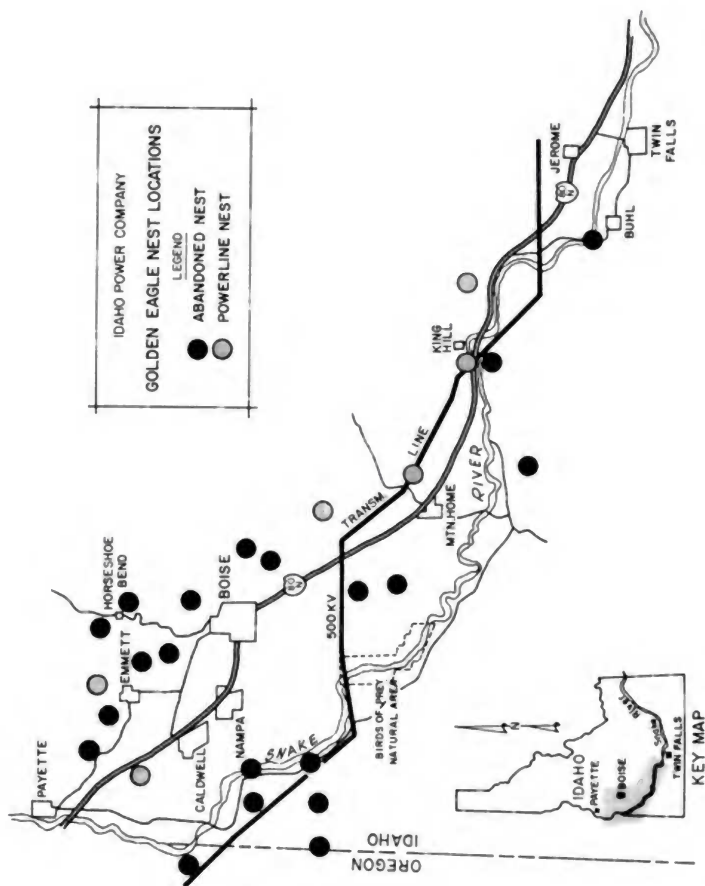


Fig. 1. Golden Eagle nest locations along the PPL transmission line in Idaho and Oregon.

old site was made, because on May 27, 1982, two young in the platform nest already had pin feathers, while the cliff nests were unoccupied.

Choice of nest sites by birds is a complex behavioral process that man knows little about. The importance of "site selection tours" was recognized years ago (D. Nethersole-Thompson and C. Nethersole-Thompson, *British Birds* 37: 70-74, 88-94, 108-113, 1944), but the factors which are evaluated by birds when they brood empty nests during these tours are unknown.

We can at least speculate about these factors in the case of the eagles nesting on the platform near Little Canyon Creek. Commonly, the wind direction of a storm will dictate where Golden Eagles perch on a cliff or power line. They carefully position themselves in calm areas and eddies which differ for each direction of the wind. This ability to respond to wind direction also protects them from wind driven rain or snow.

Likewise with nesting on cliffs or power lines. Three "shelter" factors are critical: 1) the availability of shade and wind protection for young eagles, 2) the existence of cooling air currents passing by the open towers, and 3) the anchoring of nests to prevent blowdowns in strong winds. The corners of power line towers are angular and much wider than they appear from the ground. It is relatively easy for eagles to find microclimates on large towers very similar to protected areas on a cliff. Towers also provide shade from numerous angles as the summer sun moves across the sky. The peaked shelter provided by the platform design also may emphasize shade and wind protection for the birds during "nest site selection tours".

Another important factor which may have drawn this pair of eagles away from a seemingly marginal nest site onto an artificial platform is visibility. The impacts of casual human disturbance on raptors can be minimized if the birds are not surprised at their nests. Tremendous security is provided when Golden Eagles have time to communicate danger to their eaglets when it is still a half mile or more away and then time for the adults to flee to a watchful position high overhead. It is very difficult to see young raptors on these platforms from the ground below, particularly when they lay motionless. The adults may be able to sense this circumstance through instinct, even during the early "site selection tours."

The origins of the other pair of Golden Eagles on the new PPL line and several other pairs nesting on wooden platforms or directly on towers along the adjacent Idaho Power Company line are unknown. This lends support to the idea that they are displaced pairs from some of the 20 or more abandoned sites, but closer study and more platform use is necessary to prove the point conclusively. Such a study is being developed cooperatively by Pacific Power and Light Company and the U.S. Bureau of Land Management.

The use of man-made nest substrates by raptors has been recognized as an indicator of management potential for some time (Olendorff, R. R. and J. W. Stoddart, Jr., *Raptor Research Report No. 2*:47-88, 1974). Utility poles and electric transmission towers are by far the most common types of artificial nest substrates used by raptors.

In my view the quickness with which some pairs adopt artificial structures, such as platforms on transmission towers, illustrates an "intelligence" factor, rather than a long-term behavioral modification. (The latter terminology might best be reserved for cases

where young raptors raised on man-made substrates return as adults to nest on similar substrates, e.g., power line towers). My long association with Golden Eagles makes it difficult for me not to attribute short-term behavioral choices to experience, "intelligence," and communication between paired adults and between adults and their nestlings.

Whether the wind, sun, and visibility factors—or other undetectable habitat characteristics—are recalled by the eagles through conditioning, instinct, or "intelligence" is a fine point of debate. More important is the recognition that it does happen. It is part of their behavioral repertoire and should be incorporated into eagle habitat management plans—as well as development project designs, which involve lands where the absence or low quality of nest sites limit eagle population numbers. In this way complete territories can be created for raptors displaced by human activities, and we can add a tenth reason to our list of accomplishments which allow for a more positive outlook for eagles in the 1980s and 1990s.

WHAT IS THE FUNCTION OF UNDULATING FLIGHT DISPLAY IN GOLDEN EAGLES?

by

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Abstract

Undulating flight displays of the Golden Eagle (*Aquila chrysaetos*) have been interpreted as serving mostly pair bond maintenance or courtship functions. Fifteen displays performed by several individually recognizable pairs of Golden Eagles were witnessed in northern Colorado over a 6 year period. Most displays seemed to be stimulated by and directed at intruders known to be within the home range, suggesting an aggressive and territorial function of the display. Gender specific defense of the territory was also indicated. Copulation was observed during all seasons, but was never associated with undulating display. Evidence is presented suggesting displays of eagles in winter are an expression of seasonal territoriality rather than pair bond maintenance. The function of undulating flight display may be determined by observing the responses of eagles displayed to, or by distinguishing subtle differences between displays performed for courtship pair bond maintenance and those for aggressive territorial reasons.

Introduction

Undulating flight displays (Brown and Amadon 1968: 95; Fig. 1) of Golden Eagles have been witnessed and described many times (Bent 1937, Jollie 1943, Gordon 1955, Snow 1973, Brown 1977, Ellis 1979), and in nearly all instances the behavior was considered to be mainly sexual. Arnold (1954) stated that such aerial displays were included in